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Being a Lecture delivered on behalf of the

LEIGH BROWNE TRUST,

At St. Martin's Town Hall, on December 8th, 1896,

BY

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(*For the Leigh Browne Trust*).

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To each one of us the world of organic life appeals in a particular way. We are all spectators of the same great drama of life, but we occupy—by constitution, circumstance, and chance—different seats. Thus we are surprised, or even impatient, because our neighbour from his outlook does not seem to see things as we see them. But do we not make too much of the differences and too little of the resemblances, as Bacon said long ago. For the diversity is natural enough, considering the variability of man's moods and the complexity of the facts of life.

Diverse, however, as are our personal outlooks, it seems possible to reduce them to three: practical, emotional, and intellectual. Without involving ourselves in any obsolete and fallacious classification of human "faculties," it is possible and useful to speak

thus of the three main attitudes which men have occupied and still occupy towards the living world. Let us briefly consider these, that we may remind ourselves that each has its dignity and its naturalness, though all must blend in the worthiest life.

Our Three-fold Relation to Animal Life.

(*a.*) *The Predominantly Practical Mood.*—It seems likely that man's first relations to living creatures were predominantly practical. He looked in order to do or undo; he knew for the sake of action; he named that he might quickly denote to his fellows what was dangerous or harmless, dreadful or precious. No doubt, from the first, there was thinking and feeling as well as expedient action; but it is likely that in early days man was neither very emotional nor very intellectual, but was especially practical, albeit in that dreamy, half-awakened sort of way which Æschylus has so finely pourtrayed in a well-known passage of his "Prometheus Bound."

Gradually, however, there arose the practical lore of huntsmen, shepherds, fisher folk, and

tillers of the ground; gradually, under many side influences, there has evolved the manifold art of dealing with organic life in relation to the practical needs of man. It is here that Agriculture and Medicine, and how many other arts, find their roots, and Biology one of its foundations.

It is evident that this practical mood is necessary and natural. Without its results intellectuallism would wither, and emotionalism whine away. In fact, it has a dignity which it seldom claims.

Yet, when the practical mood becomes absolutely dominant, when things get into the saddle and over-ride ideas and ideals and all good feeling, we know the results to be vicious. The vices of the dominant practical mood are well known—baseness, belittlement, brutality. But it is equally true that there are other vices attendant on the dominance of the emotional and intellectual moods. Their condition of sanity is to be kept in touch with each other. The point, to put it concretely, is that the veterinarian is just as natural, ancient, and worthy as the philosopher. What one would wish is a fusion of ideals.

We cannot but have a great respect for the practical man, yet the problems of life are apt to seem simpler to him than they really are. The practical man elects to do, not know, but his practice may be more dogmatic than any dogma; he will away with all sentiment, though he professes to keep close to the facts of life; he cannot abide any theory—except his own; he distrusts all speculation, and will live, he says, in the *real* world, yet in so doing he may be naïvely hugging close to himself his own particular idealism!

I have just suggested that there can be no escape from theoretical difficulties by vowing to be wholly practical, but even the practical problems are far from easy, *especially* when considered *per se*. Let me take an illustration. It is surely a practical biological aim to conserve life rather than to destroy it. But one of the sad biological facts of to-day is the extermination of many beautiful and noble forms of life. We probably breed new species of Bacteria, but we exterminate bisons and beavers, and how many more. This is a practical problem, but very difficult.

We must grant that there is "a time to kill," for example, when our friend is under the tiger's paws. Not much seems to have resulted from the example of the Eastern saint, who in pursuance of his non-resistance creed yielded himself to the hungry tiger, in the hope that his gentle blood might dilute the tiger's fierceness. According to one version, at least, it only whetted the carnivore's appetite for more of the same sort. There is surely a time to kill.

But even a slight acquaintance with the records of naturalist-travellers, *e.g.*, in Africa and S. America, suffices to convince us of man's fell exterminating power, and makes us feel that there is surely a time to refrain from killing. It is only necessary to read Mr. Hudson's *Naturalist in La Plata* to be convinced of this. How is the balance to be struck?

We need not, of course, leave our own shores to find cases of the most careless irreverence of life. Thus, writing to the *Times*, Mr. Hudson notes that when a pair of hoopoes recently nested in a hollow tree at Southwick, they were allowed to hatch and partly rear their young, then religiously killed and stuffed!

One welcomes such constitutional expressions of opinion as Wild Bird Protection Acts, such practical expedients as the establishment of Reservation Regions, and such an organisation among sportsmen as the Boone and Crockett Club in the States, for all these express a desire to recognise and respect the rights of the creature. One welcomes, too, the efforts of influential men like Sir Wm. Flower, and even more a conscientious criticism of consumption on the part of many. But still it is very difficult. Let us simplify the problem a little by fixing our attention on snakes, which still bite the heel of progressive man. Is it well to be very enthusiastic for the extermination of venomous snakes in India? We are shocked to hear that they kill over 20,000 human beings per annum, though it is only fair to notice that this number represents but a small percentage of the population; and as it is said that they tend on the whole to cut off the stupid and careless, the question rises whether it would not be well—in respect of this—to leave snakes alone. Those who believe (I am sure I do not) that Bacteria have raised man to what some call

his present pitch of physical perfection by always cutting off the weakly and dirty and sluggish—(a thesis ably expounded in Dr. Berry Haycraft's *Darwinism and Race Progress*) —will probably believe that snakes have evolved the wisdom of the East. Indeed, I have heard a Deputy Surgeon-General, for whom I have all respect, say so. Should we not, therefore, leave the snakes to continue their good work?

But our friend's little boy hid his sweetmeats in a hole in the wall, and on seeking for them again was bitten, and after some severe suffering was soon dead. This pathetic personal tragedy rouses us again from the *laissez-faire* position, and we say "Death to the Snakes," and we offer rewards of so many annas per head. Yet when we find a wily native breeding the said snakes in a secluded corner that thereby he may bring the more heads and make many more annas, we wonder whether we or the snakes are doing most harm. And once more, when rats and vermin increase, as snakes decrease, we wonder whether we had not better have left ill alone?

But then, finally, we read in the *British*

Medical Journal, November 21st, 1896, that Surgeon-Major Rennie saved the life of a boy who had been bitten by a krait by injecting Dr. Calmette's anti-toxin preparation from immunised horse or donkey serum, and we wonder if science is to conquer after all? It is too soon to speak, but surely there is a seamy side here, too!

In some cases the issues seem fairly clear—disturb the balance of nature by destroying the natural enemies of the vole, and, weather permitting, you will have a plague of voles, and thereafter a vole commission—both expensive. But instead of the crusade against the voles it might have been wiser to have had no persecution of the voles' enemies. The moral to human affairs is not far to seek, viz., that one wrong breeds another, as has often been illustrated since the time of the plagues of Egypt.

I have ventured on this digression at the outset in order to make clear what is at least my conviction—that it is often far from easy to know what to do. Do the right, some one says. Truly, we are agreed about that, but what is the right in detail? The predominantly

practical mood is hardly sufficient to give answer.

(*b.*) *The Predominantly Emotional Mood.*—Quite different from that of the practical man is the mood of those who find in animal life a stimulus, not so much to action as to admiration, not so much to doing as to feeling. From the unknown first emergence of "the gentle-man" until to-day, the drama of animal life has not ceased to appeal to the human emotions. As man gained firmer foothold among rival organisms, the emotional tone, which had always been associated with his activities, rose into dignity as a distinct mood.

The herbs and the trees, the birds and the beasts, sent their tendrils into the human heart, claiming and finding kinship. From the old superstitious fear of the strange to the awe of Walt Whitman before the mouse, which "staggers sextillions of infidels"; from the ancient half-understood animal worship to the wonder of the Laureate who lingered lovingly over the life of the brook and exclaimed, "What an imagination God has!" from the irresponsible pioneer artist who etched the elk on the mammoth tusk down to Landseer;

from the sublimity of the Nature-Psalms to Meredith's Lyrics of the Earth; from Mowgli in the jungle to Richard Jefferies in the English woods; there is the same emotional keynote —different as the rhythms may be.

Just as before, this mood has its obvious virtues. It helps to keep our souls alive to the harmony hidden in the heart of things; it is part of the salt of life. Yet it has its vices, and may, unruled, become morbid, mawkish, and mad. It expresses none the less a natural and necessary development of the human spirit, and is a needed counteractive alike of over-doing and over-knowing.

We must recognise throughout that the normal is a *via media* between pathological possibilities, that even benevolent soft-heartedness, as Von Hartmann observes, may be a very inconvenient quality, "as was illustrated by the forty-nine cats with which the good-natured young poet found himself blessed a year after he had interdicted the destruction of the first litter."

I may be mistaken, here as elsewhere, but it seems to me that the emotional mood, unless tempered by thought and tested in

action, is liable to be as vicious as any other loss of equipoise or disregard of the unity of life.

How gratuitous, for instance, is the doubt, frequently expressed of recent years, as to whether the drama of animal life is a moral spectacle. Those who have this doubt shudder at what they call the cruelty of nature. But it is well to make sure first that they *are* observing nature, and not themselves projected into it. If there is to be any shuddering, perhaps it might profitably restrict itself first to the cruelty of human nature, and to the grotesqueness of human impertinence.

I can hardly conceive of anything more miseducational—to use the mildest possible term—than showing deathful experiments on animals to young folks, as is said to have been done in certain schools, but I would in all seriousness say that to teach a child that a flower is pained when pulled to bits, is a sin of the same degree. All the deadly sins have the same degree. By all means let the child come to feel naturally that it is a pity to pull a beautiful thing—a beautiful life — to bits without some good reason, but do not let us have any lies at the roots of our emotional culture.

At the same time, we must clearly recognise that just as the practical man has some justification when he recoils from science because, as he says, it is too theoretical, so the artist, poet, or man of feeling has some justification when he recoils from science because it is too analytic. He feels instinctively the involved loss of unity; he is accustomed to see things in their totality, and is vexed when this aspect is lost sight of. Thus you may have poets of evolution, like the late Miss Mathilde Blind, but hardly of dissection! In wider statement, the man of feeling is justified in saying, "though I could remove mountains, like the practical man, and though I could know all things, as the scientific man would, yet if I have not charity, I am as the tinkling brass and sounding cymbal."

(*c.*) *The Dominantly Intellectual Mood.*—It is plain that science is not germinal either in the practical or in the emotional mood. For though science has some of its roots in practice, and is saved from error by every touch with life, it is not practical either in main intention or in main result. Similarly, though emotion has influenced science for

good and ill, and though science has in turn given nutriment to emotion, it remains true that science is fundamentally non-emotional.

Darwin expresses the contrast between the scientific and the emotional mood when he speaks in one of his letters, rather pathetically, of the pleasure he had on one occasion in simply surrendering himself to the enjoyment of the flowers and birds around him, without for once asking how they came to be thus or thus.

The student of science seeks, not like the practical man to realise the ideal, but to idealise the real. He elects to know, not do. He would make the world translucent, not that emotion may behold the glimmer of the light which shines through, but for separate reasons, because of his inborn inquisitiveness, because of his dislike of obscurities, because of his longing for a system—an intellectual system in which phenomena are rationalised.

Biology only began as such, and at first very spasmodically, when men found leisure to try to think out the living creature, abstracting for the time all considerations of utility, and as far as might be all emotional bias.

It has, like the other moods, its virtues of method and ideal. It is painstaking, patient, and precise; it is careful, conscientious, contriving; it aims at clearness, translucence, rationality; it will make a working thought-model of the organic world.

It has also its vices, of over-knowing, of ranking science above life, of ignoring good feeling, of pedantry, of monomaniacal muck-raking for items of fact. Yet it is a natural and necessary expression of the developing human spirit, and supplies the intellectual foundation, without which practice is merely empirical and emotion superstitious.

The Unity of Life.

There are, then, these three main moods or attitudes of mind observable in human relations to animal life—practical, emotional, and intellectual. They find expression in doing, feeling, and knowing; in practice, in art, and in science; they may be symbolised by hand, heart, and brain.

They are all of equal dignity, for all are essential; and each is correlated to the others, for life is a unity. We do not suppose that

there *are* altogether separable faculties or nonsense of that sort, we do not say that there are *any* purely practical, or exclusively emotional, or solely scientific men ; we simply note the fact that a certain mood has often a temporary dominance, and that we can practically distinguish among ourselves the doers, the feelers, and the knowers. We all err in over-doing, *or* over-feeling, *or* over-knowing.

It is believed by most comparative physiologists, and, as far as I know, rightly, that the ears of many of the simpler animals are not hearing ears, but directive ears, important in balancing and equilibrating. It is such an equilibrating organ that we all need.

Thus my first thesis is simply that of the Unity of Life. Completeness of life is the condition of sanity, of body, soul, and spirit. It spells health, wholeness, holiness, as Edward Carpenter has said.

Contrariwise, non-humane practice, emotion, or science, arises primarily from a disruption of the Trinity, a denial of the Unity of Life. To be wholly practical is to grub for edible roots and see no flowers nor stars in life; to

be wholly emotional is to become unreal and mad; only to know is to deny our birth-right and birth-duty as social organisms, or, at the very best, to forget that our chief end is not merely to know God, but to enjoy Him for ever.

It comes to this, then, that we may be and are led astray—to varying degrees, of course—in three ways;—by a predominance of the so-called practical mood, unrelieved by sentiment and untutored by science; by a predominance of the emotional mood, unballasted by a knowledge of facts, untested by practical effort; or by a predominance of the scientific mood, uncompleted in emotion, unchecked by practice. The particular problem before us is in regard to a department of science, and my main thesis—a commonplace to some, possibly nonsense to others—is that science for its own sake requires to be continually moralised and socialised, oriented, that is to say, in relation to other ideals of human life than its own immediate one of working out an intellectual cosmos.

Our science requires to be kept in touch at once with our life and with our dreams; with

our doing and with our feeling; with our practice and with our poetry.

Synergy and sympathy are needed to complete a synthesis.

The Unity of Science.

But we must now get nearer our specific subject and think for a little of the unity and harmony of the sciences. The concrete sciences are arranged conveniently in five Groups:—I. Chemistry; II. Physics; III. Biology; IV. Psychology; and V. Sociology. These disciplines, blocked apart for practical convenience, treated of in separate books, expounded by different teachers, are parts of one discipline, and have their ideal completeness only when inter-related. This is the ideal alike of the philosopher's stone and of most modern scientific synthesis.

Biology, the science of living organisms, is central, its foundations run down into Physics and Chemistry, its results run up into Psychology and Sociology. To ignore the foundations has been called the fallacy of transcendentalism, to deny the higher divisions of the hierarchy has been called the

fallacy of materialism. Perhaps we are better without these terms, the point being simply that the sciences are correlated, form one body of truth, and must be thus studied. This is, indeed, a familiar idea to students of Comte on the one hand, or Spencer on the other, and has been beautifully worked out from another position by Principal Caird in an address on "The Unity of the Sciences." But while the idea is easy to state, the ideal is hard to realise.

The living organism is a synthesis, whose secret has not been solved, but we are surely helped to understand it, on the one hand, by what we know of the relatively simpler chemical and physical phenomena, and also, on the other hand, by what we know of mind and of society. There are lights from below and lights from above, to shut out either means obscurity.

On the one hand, it is a materialism to ignore what is novel at each great step, to give a false simplicity to the higher phenomena by forcing upon them the categories of the lower. Life transcends mechanical categories, just as man transcends the categories of purely

animal Biology. On the other hand, it is, perhaps, equally fallacious to disregard the light which the study of the higher syntheses sheds upon the lower, which Psychology and Sociology shed upon Biology.

Kant said: "Giebt mir Materie, und Ich will daraus eine Welt schaffen." (Give me material, and I shall make a world out of it.) But is not the whole point in the second word, *me*—Give *me?*

There is a sense in which one uses the Amœba in order to explain man; but it is at least equally true that one needs man in order to explain the Amœba.

I cannot go further into these questions; it is perhaps enough to notice the matter of fact that such valuable conceptions as division of labour and evolution were first made clear in regard to human affairs, and were thence transferred to and verified in the study of organisms.

We also know as a matter of history that fresh life has repeatedly been given to Biology by the discovery of what may be called *a new contact*, where it met some other science. In the same way it may be said that contact

with Biology has quickened Psychology to new life.

In passing, I would allude to the probable future which is before the application of mathematics to Biology. The results gained by Francis Galton, Karl Pearson, Prof. Weldon, and others, lead us to hope for much.

Likewise, the importance of renewed contact between Philosophy and Biology is fairly obvious. Errors of both sides have probably resulted from lack of sympathetic union. And here I may refer those interested to my friend Mr. Sandeman's recently published volume—a tough mouthful—*The Problems of Biology*, in which from a philosophical point of view he furnishes a much needed criticism of the categories of modern Biology, and expounds the fundamental idea of the unity of the organism. (*Here followed in the lecture some concrete examples of the humane study of Biology.*)

To illustrate further what I would call the humane study of natural history, allow me to refer to the just published work on *Habit and Instinct* by my friend Professor Lloyd Morgan, of Bristol. It is full of

valuable and suggestive observation, all of a kind which leads on to something else, all of a kind which it is pleasant to think about.

Mr. Lloyd Morgan, instead of merely talking and thinking about instinct, as so many have done, set himself to definite experimenting, and may almost be said to have begun a new chapter in comparative psychology. Thus he incubated eggs of various birds in an incubator, and himself acted as their foster-parent. It is pretty to read how his young partridges would follow him about. Since the young birds saw no mother, and had none of "the advantages of education," their inborn or instinctive powers were studied in all their purity.

The researches I have just referred to have absolutely nothing of the non-humane about them, but that is only a negative virtue. They are positively humane for they respect the unity of the organism; more than that they are in their result important to both Biology and Psychology. Indeed, when carried on to man they come to be of social importance. I have a great admiration for Mr. Lloyd Morgan's work, and I hope I do not offend

against good taste when I note his personally synthetic position as geologist, biologist, and psychologist, as musician, and as head of a college. His work expresses himself. It may well serve as a model and encouragement to us all.

The Unity of the Organism.

Bearing in mind these two ideas of the unity of life and the unity of science, let us in the third place think of *Z*oology in particular.

An animal comes within the field of our experience. As practical people we decide very quickly whether we mean or not to make further acquaintance with it, whether we may watch it or must kill it, whether we can eat it, or it us, and so on. Often prejudice is so strong that the story ends here, without any *Z*oology.

In other cases, however, the tendrils of the animal's life touch ours. It claims kin with us as part of the great bundle of life. We pause to wonder, to enjoy, even to love. And again it often happens that the story ends here—without any *Z*oology.

Biology begins as such when we begin to think out the plant or animal, when we ask the four great questions :—

(1.) *What is this*, in form, structure and parts?

(2.) *How does this live*, in its relations to the earth, in its relations to its fellows, in its internal workings?

(3.) *Whence* came this, in its individual becoming, and in its ancestral emergence; as an individual, and as one of a race?

And finally (4) *Why and how* is this in structure and functions, in development and pedigree, just as it is, and not otherwise.

(1.) The answer to the first question: *What is this?* asked again and again at different planes of analyses, comprises what is called morphology, which regards the organism in its static aspect, and studies form and structure.

In early times the answer was chiefly concerned with the external appearance of the intact creature, but Cuvier and Jussieu established the comparative anatomy of organs, Bichat and others disclosed the web of tissues, Schwann and others analysed down

to the unit elements or cells, and the work of recent years has been in great part concerned with the microcosm within each cell, and with the living matter or protoplasm itself.

In studying structure (Morphology) the methods are plainly,—observation, analysis, and comparison. We study external form and symmetry, always harmonious and beautiful in a natural wild animal. We work till we see the creature through and through as if it were transparent; we persevere till we see it as a great city—far excelling any city of ours—with regions which we call organs, streets which we call tissues, houses which we call cells. We work on till we see the intricate structure of each house—the furnishings and inhabitants of the cell. We return to the unity and compare organism with organism and detect relationships; we compile a census, and construct a genealogical tree.

Now all this—so dry perhaps in summary—is as some of you know well most interesting in detail, so captivating indeed that to many it is almost their whole life. It needs no fostering, it will submit to no hindrance: till

the book of life is closed, it is not likely to cease; it seems safe to say that there will always be inquisitive morphologists who must see into things. It is also quite essential, supplying as it does a solid foundation for further inquiries.

At the same time, it must be noted that it is partial, that it is not the whole of *Z*oology as some seem to suppose, that it has to do only with the static relations of animals, that for the morphologist the animal is *dead*.

Morphological Science appears non-humane when it fills the whole field of a man's life, it becomes fallacious when it dominates the mind till the life of the creature is forgotten, it does itself injustice when it becomes purely quantitative in its results, and it is out of place when it is prematurely forced on the young mind as an educational discipline.

Let us bow respectfully to the Cuvierian School, and pass on.

(2.) The answer to the second question: *How does this live?* forms what we call Physiology, the science of functions and habits, which considers the organism in its kinetic aspects.

In early times the answer was chiefly concerned with the external life and habits of the intact creature. But as the anatomists revealed the intricacy of the engine, the physiologists were bound to follow, and the easy-going unanalytic physiology of habit and temperament gave place to a study of the functions of organs. But Bichât again led the way to a deeper analysis, to a study of the properties of tissues; and now we are face to face with the inner life of cells, and with the chemical changes associated with living matter.

You may remember how Clerk Maxwell as a boy had often on his lips the question, "*what is the go of this?*" "*what is the particular go of this?*" He was not himself much concerned with living creatures, but his was the physiologist's question. The physiologist has to do with function not form, with activity rather than structure. His methods are observation, experiment, and analysis. His result when achieved is that the organism is not merely seen through and through, but its workings are seen, in imagination I mean of course, the beating heart, the contracting

muscle, the phases of the cell, the up-building and down-breaking associated with the protoplasm or living matter. Nor is he concerned merely with the individual animal as an engine, for if he really understands his vocation he has to deal with the animal as an intact unity with habits and customs, interrelated with mate and family, with friends and foes, and with the great web of life all around.

Now it is evident that this is as essential as morphology, and as sure to flourish. It is liable to the same vices of pre-occupation with detail, of exaggerated analysis without corresponding construction, of losing the synthesis in the analysis. Like the morphologist, too, though in a different way, the physiologist is apt to forget that life is more than science. One must grant him the credit of sometimes thinking last of all of his own.

It is noteworthy, as Prof. Geddes has pointed out with great clearness, that morphology and physiology during the last hundred years or more have had a parallel and logical development — a gradually

deepening analysis—from organism to organ, from organ to tissue, from tissue to cell, from cell to protoplasm.

What Biology looks forward to, could firm foot-hold be found, is a parallel synthesis, an intellectual reconstruction of the organism which has been so laboriously taken to bits.

(3.) The third question is—*Whence has this organism come*, as an individual growing from an egg, as a species emerging from antiquity.

This two-fold study of becoming is comprised in the two sub-sciences of embryology and palæontology—"Geneology." You may remember how the geologists are spoken of in St. Ronan's Well, as "running up hill and down dale knapping at chucky stanes like sae mony road-makers gone daft," and a similar misunderstanding still persists in many minds in regard to the palæontologist. He is a dryasdust poring over antediluvian vestiges, a mere fossil-hunter, a burrower in the graveyard of the buried past. But this is a caricature. Surely we all recognise that the palæontologist is the historian of the times before history, the specialist on the rise and fall of

races, the man above all others who can interpret the present in the light of the past.

So, too, the embryologist is seen aright when we recognise him as the specialist on child-study, on the childhood of animals, as the guardian of the Water-Babies, as, above all, the student of that great mystery which we call organic growth, the very idea of which is so important alike in our thinking and practice.

(4.) Lastly, comes the most difficult question of all. *Why and how is this organism what it is?* This is the study of causes, Ætiology. It centres around the idea of evolution, in regard to which we say much, but are sure of little, except that evolution is the modal explanation of the organic world, and is in part worked out by the selection of variations.

My whole point here is just this. There are four well-marked departments subordinate to Biology, viz., Morphology, Physiology, "Geneology" and Ætiology, but the organism is one. We do not fully understand a living creature, but we feel sure that in a very real sense it *is one*. The sound development of the various sub-sciences seems to me to depend on the continued and more thorough

recognition of this—the unity of the organism. In other words, if there is to be a Biology at all, it must be a synthesis, not a mere sum, of the various sub-sciences.

The Outlook.

It is an impressive thing to stand by and calmly watch the succession of gifts laid on the altar of science. There are the well-finished offerings of those who have what seems to some of us so inestimably precious—the leisure to work thoroughly undisturbed; there are the half-finished offerings of the impetuous, and enthusiastic, and hard-driven; there are humble offerings which have involved years of self-denial; there are brilliant offerings which have meant but a few flashes of clear insight; there are tarnished offerings which have been gained illegitimately; there are heroic offerings which are received *in absentiâ* from those who have died to know; there are epoch-making offerings, like those of Darwin, which set the whole altar aflame. But altogether, I say, an impressive sight; altogether not one of which mankind has a right to be ashamed.

When we contemplate this immense stream of zoological work, the first impression is surely that of great admiration. If thereafter we begin to be critical we notice that some of the work is rather quantitative, and might have been dispensed with just yet, that a few pieces of work are foolish, that a few are merely polemical, that a few are ugly and do violence to the Unity of the Organism, not to speak of the Unity of Science and the Unity of Life.

On the whole, however, the great body of the work would, I think, be esteemed good by any wise judge, wise for science and wise for humanity. I do not know of any sufficiently wise judge, except Time, whose decisions are often very slow.

What I wish to be at is this. There is need for and justification for *all* honest biological work which recognises the three Unities, or, if this be too strict a test, for all work which is within its limits sound and sane. I cannot profess to believe that there is equal urgency for all kinds of biological work; perhaps the most urgent at present is what has been called Experimental Evolution Research; but it would be at once ungrateful and foolish to

depreciate any piece of able work because one thinks that the energy it represents might have been more profitably directed elsewhere.

It may be taken for granted, surely, that any really good piece of work on whatever line was in most cases natural to the worker, and simply had to come, and that to wish it had been on a different plane is to be like a child crying for the moon.

But I have not yet got quite to my point, so anxious am I to be just to myself and to my fellow-workers. My point is this. There are some pieces of work which seem to be inhuman, or, as I should prefer to say, which violate all the Unities. Their gain is counterbalanced by the involved loss. Then there are pieces of work which are humane, to the extent that they violate none of the Unities. On the highest plane, there are pieces of work which are positively humane—they tend to develop the Unities.

It is certain that large conceptions such as Evolution, Selection, Heredity have dominated and unified years of research and hundreds of memoirs. Is it really vain to look forward to years of research and

hundreds of memoirs dominated and unified by the conception of the three Unities?

An Apology for Biology!

Let us suppose Biology arraigned before the bar of Humanity,—as it should, I maintain, constantly feel itself arraigned, the lines of defence might be briefly stated thus:—

(1.) First, that it is, like the other sciences, a natural and necessary expression of the human spirit, at once a development and a discipline of man.

(2.) Second, and "without prejudice," that it is justified by practical results. In spite of many mistakes, it *has* made important contributions in relation to human health, the supply of food, the use of animals, and much else. Without prejudice, we must say, since we cannot, for a moment, allow that a science as a science should ever submit to the practical man's canon which makes *immediate* utility a stringent criterion of worthiness.

(3.) Third, that while the partial pursuit of certain paths may sometimes have dulled or even played false to healthy emotion, the general result of Biology is to deepen our

wonder in the world, our love of beauty, and our *joie de vivre*.

(4.) Fourth, that it has partially worked out certain general conceptions of life and health, of growth and development, of order and progress, above all, of Evolution, conceptions which are not only attempts to see more clearly what is true, but which make for deeper feeling and for the betterment of life.

Addressing a representative jury, before whom I happen to be the counsel for the defence, I admit that Biology has no unblemished record, nevertheless I ask confidently for a verdict in its favour on the general ground that with all its faults it has contributed nobly to the *ascent of man*.

A Basis of Criticism: and a Summary.

Can we not reach some foot-hold on which, as humanitarians, as lovers of animal life, as scientific thinkers, teachers, and students, we may stand firmly, facing the tide of research and the spray of fashion, opinion, and controversy. To indicate this foot-hold and to rise above *particular* criticisms to a general basis of criticism has been the object of this

paper. The desired foot-hold is in a recognition of the "*Three Unities*."

(*a*.) The first unity is *the unity of life*. By this we mean that a whole sane life implies a recognition of the Trinity of knowing, feeling, and doing, of brain, heart, and hand. We cannot hope to have these three sides of our nature all strongly developed, or even perfectly equilibrated, but we must strive to be keenly aware of the three sides.

The solely scientific man is apt to dislike his very practical brother, and he instinctively recoils from sentiment. But he is bound to try to understand the other positions, to see them as correlates of his own, and to mistrust his own because it is partial.

The dominantly emotional type recoils from the scientific and the practical alike, but when the emotionalist talks about the lust of knowledge, he betrays at once that he has never known the passion of science.

The purely practical people likewise fail to understand, and therefore dislike, both the scientific and the sentimental. It can only be deplored that they have let two of the lights of life die out.

There is no room for any bias; the solely scientific, the exclusively emotional, the purely practical, are *all* unnatural and vicious. And though it may be said that these extreme one-sided types are rare—which is a matter of opinion—this does not affect our argument which applies not merely to types of men, but to lines of conduct or thought or feeling, in which, for the time being, one attitude has been allowed to assume dominance. The various sins of human relations to animal life —sins of cruelty, of ignorance, of nonchalance —depend primarily on a disruption of the Trinity of doing, feeling, and knowing. More positively, the healthy development of Biology requires that the science be continually moralised and socialised.

(*b.*) The second unity is *the unity of science* or of knowledge. The sciences in the broadest sense form one body of truth. Biology stands midway between Physics and Chemistry, beneath it, and Psychology and Sociology, above it; there are lights from beneath and lights from above; to shut out either means obscurity. Or, again, if science be at best but "a broken mirror" of the

world, how much we need the help of the philosophers!

(*c.*) The third unity is that of the organism. We have so many questions to ask, each so difficult, that in our asymptotic search for answers we are apt to forget *the unity of the organism*. What is this as an entire structure and in its minutest part? How does it live? Whence came it as an individual and as a race? How is it what it is and not otherwise? These are the important questions, and the answers become sub-sciences of morphology, physiology, and so on, each again sub-divided in endless specialism.

All are necessary, but their virtue is surely in great part lost when they are not synthetised, when the specialist remains like a beetle in a rut, the sides of which form the horizon.

As a result we have many intellectual vices —vices of ignorance (of other subjects), vices of neglect (of other workers), of pre-occupation with trivial detail, of purely quantitative accumulation of items of fact, of exaggeration due to lack of perspective, of mere necrology. In short, biology becomes vicious when it ignores the unity of the organism.

To sum up, there are a certain number of 'isms which we scornfully call faddisms. These express a loss of perspective—intellectual, emotional, or practical. Each has usually its virtue, each is as surely vicious. We need not scorn any one in particular, since the chances are that we are the victims of another! At the same time, we see that the line of progress is to study the psychology of these 'isms, to recognise them as reactions against some denial of one or other of the three unities, or of a fourth, which I have not mentioned; to see them, also, as *natural* exaggerations, to be lamented always, but to be pardoned in proportion as they are understood.

Three Questions.

With an outlook at once towards peace and towards progress, I would suggest that we biologists should oftener ask ourselves three questions.

(1.) To the biologist, as a biologist, the question is: Am I in my thinking and teaching and research, recognising, respecting, and doing no violence to *the unity of the organism?*

Am I studying it *as I would have myself studied?* A brilliant philosopher wrote a paper recently on the supposed uselessness of the soul; has not the biologist sometimes need to read a paper on the supposed uselessness of the life?

(2.) To the biologist—as a student of science—the question is: Am I in my thinking, and teaching, and research, recognising, respecting, doing no violence to the *unity of science*. Am I recognising other bodies of thought *as I wish they would recognise mine*. Thus it seems almost self-evident that most of the so-called conflict between science and theology would have been obviated if the disputants had taken the trouble to recognise their mutual positions, and to keep from mixing up two quite distinct sets of terms — material and spiritual—in their respective discourses. The long spun-out controversy between materialism and vitalism illustrates at least the intellectual disaster of science divorced from philosophy.

(3.) To the biologist, *as a man*, the question comes: Am I in my thinking, teaching, and research, recognising, respecting, doing no violence to *the Unity of Life?* Does this piece of work mean much to other workers,

to men? Is it quite consistent with healthy feeling and good conduct? *Does it violate nothing in my birth-right and birth-duty as a social person?*

Finis.

I feel that there is something else to say—much else indeed—but one thing in particular. I do not myself know how to say it, but I came across a sentence the other day which indicates what I should like to know how to express. It is from a book by Professor D. G. Ritchie entitled "Darwin and Hegel," and reads as follows:—

"The 'truth' of our separate selfhoods is only to be found in our ultimate unity, which religion calls 'God,' which Ethics calls 'goodness,'—a unity which is not the abstract 'One' of the Neoplatonist, but an organic unity realised in a society which is not a mere aggregate of individuals, but a spiritual body animated by that love which is the highest religious conception of Deity."